PROJECT TITLE: Winter Cereal Forage Performance Evaluation under No-Till, Dryland, Chemical Fallow Conditions near Havre, Montana. (Exp. 10-FR02).

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OBJECTIVES:

To provide winter cereal forage producers in north central Montana with a reliable, unbiased, up-to-date source of information that will permit valid dryland forage production comparisons among improved and experimental cereal forage entries submitted for testing by participating commercial and university entities. This information should help cereal forage producers in north central Montana select varieties best suited to this region of the state.

METHODS:

There were eight winter wheat and eight winter triticale cereal forage experimental lines and named varieties submitted for testing under no-till, dryland, chemical fallow conditions near Havre, MT (Table 3). The five publically available varieties in the trial included one winter triticale, 'Trical 102', and four winter wheats, 'Elduraldo', 'Newturk', 'Willow Creek' and 'Yellowstone'.

The trial was seeded as a randomized complete-block design, in replicated, 3-row, 22-foot plots on a 12-inch row spacing utilizing a self-propelled cone seeder. The cone-seeder was equipped with 'Haybuster' openers modified to provide narrow, paired-row seed placement for enhanced seed/fertilizer separation. Each plot was seeded with 41 grams, equal to seeding 60 lbs per acre. Due to poor planting conditions, seeding depth was 1 inch. Heading date was recorded as the date when 50 percent of the heads within a plot had elongated above the collar of the flag leaf. Forage harvest date of each plot was seven days post heading. One entire row (18 feet) was hand clipped from each plot for determination of forage dry matter. Following dry matter determination, samples from selected entries were ground and submitted for quality analyses. Results of these analyses are summarized for the winter cereal forage in Table 3. Two rows of each winter cereal forage plot were allowed to ripen in order to record seed production components of the winter cereal forage entries. Seed component data for the winter cereal forage is summarized in Table 4. Trial management information is listed Table 5.

RESULTS and SUMMARY:

The cereal forage cropping environment in 2010 at the Research Center was categorized as above average with higher than normal precipitation and lower than normal temperatures. At Havre, total annual growing season precipitation (9/1/08 through 8/31/09) was 14.61 inches, 22.5 percent more than the average for all years since 1916 (Table 2). April 1 through July 31 precipitation was 9.69 inches or 144 percent of the 95 year average. Heat units expressed as "Growing Degree Days" (GDD, base 50) from May through October, were 2220, 93 percent of the average for the last 59 years (1951-2010). The last spring frost was one day early with the first fall frost 24 days late, resulting in 154 frost-free days, 25 days longer than the 95 year average. September 2009 through March 2010 precipitation was 91 percent of the long-term average. The April through June growing season saw an average daily temperature at 51.5 degrees F, 1.7 degrees below normal. July and August average temperatures were 3.1 percent lower than normal with the high for 2010 recorded on August 27 at 102 degrees F. There were 18 days 90 degrees F or above, and only 1 day with temperatures 100 degrees F or above. Overall, the growing season was cooler than the 95-year average. The minimum winter temperature was –35 degrees F on December 7. Crop outlook was very good with adequate fallow-stored soil moisture and generally favorable growing conditions.

The winter cereal forage entries performed well with the excess spring moisture and below average temperatures. Overall, winter cereal forage dry matter yields averaged 3.20 ton/ac. Nine of the 16 entries yielded forage dry matter equal to Willow Creek winter wheat, the highest yielding entry at 3.84 tons per acre (Table 3). Quality analyses results are included for selected entries in Table 3 and nitrate concentration effects on livestock are summarized in Table 1.

Seed production across all winter wheat and triticale entries averaged just over 54 bu per acre. Yellowstone winter

wheat produced the highest seed yield at 71.2 bu/ac. Seed component data including stand percent, heading date, plant height, yield, moisture, test weight, protein and sawfly cutting are reported in Table 4.

FUTURE PLANS:

Although there is currently no funding available to support this research, Northern Agricultural Research Center, near Havre, Montana believes that this information is very important for local farmers and ranchers and will continue the winter cereal forage trial in 2011.

TABLE 1. Effect of nitrate concentration on livestock.

(Note: These guidelines for Montana are more conservative than those published from other states.)

Reported on 100% dry matter basis* as:		
NO_3-N (ppm)	**NO_3 (ppm)**	**Comment**
< 350	< 1500	Generally safe for all conditions and livestock.
350-1130	1500-5000	Generally safe for nonpregnant livestock. Potential early-term abortions or reduced breeding performance. Limit use to bred animals to 50% of the total ration.
1130-2260	5000-10,000	Limit feed to 25-50% of ration for nonpregnant livestock. **DO NOT FEED TO PREGNANT ANIMALS** - may cause abortions, weak calves and reduced milk production.
> 2260	> 10,000	**DO NOT FEED**. Acute symptoms and death.
*If nitrate content of a feed is reported on an "as is" basis, convert to 100% dry matter basis to compare it to levels in this table. For example, silage at 50% moisture that contains 600 ppm NO_3-N on an "as is" basis contains 1200 ppm on 100% dry basis; thus, it fits the second group in this table.		

Information adapted from MontGuide MT 200205 AG, "Nitrate Toxicity of Montana Forages", by Dennis Cash, Rick Funston, Marc King and Dave Wichman.

Table 2. Summary of climatic data by months for the 2009-2010 crop year (September to August) and averages for the period 1916-2010 at the Northern Agricultural Research Center, Havre, Montana.

Month Year	Sep 2009	Oct 2009	Nov 2009	Dec 2009	Jan 2010	Feb 2010	Mar 2010	Apr 2010	May 2010	Jun 2010	Jul 2010	Aug 2010	Crop Year
Precipitation (inches)													**Total**
Current Year	0.39	1.25	0.00	0.69	0.72	0.28	0.31	2.39	3.36	2.54	1.40	1.28	14.61
95-Year Average (1916 to 2009-10)	1.14	0.66	0.43	0.45	0.44	0.32	0.54	0.99	1.78	2.55	1.43	1.19	11.92
Mean Temperature (^{o}F)													**Average**
Current Year	64.1	38.8	38.8	7.0	13.1	12.2	32.7	44.7	49.4	60.3	66.7	66.7	41.2
95-Year Average (1916 to 2009-10)	56.2	45.7	30.2	19.5	15.4	19.9	30.0	43.6	54.0	61.8	69.2	67.3	42.7

Last killing frost in spring*

2010 ____ **May 13th (31˚)**
Ave. 1916-2010 ____ **May 14th**

First killing frost in fall*

2010 ____ **October 14th (31˚)**
Ave. 1916-2010 ____ **September 20th**

Frost free period

2010 ____ **154 days**
Ave. 1916-2010 ____ **129 days**

Growing degree days (base 50)

May 1-Oct 31, 2010 ____ **2219.5**
Ave. 1951-2010 ____ **2379.2**

Maximum summer temperature ____ **102˚ August 27th**
Minimum winter temperature ____ **-35˚ December 7th**

*In this summary 32^{o} is considered a killing frost.

TABLE 3. WINTER CEREAL FORAGE - forage components. Winter Cereal Forage Evaluation Grown Under No-Till Dryland Fallow Conditions. Northern Agricultural Research Center. Havre, Montana. 2010. (Exp# 10-FR02-FR)

Species	CULTIVAR or SELECTION	2010 FORAGE DRY YIELD Lb/Ac	2010 FORAGE DRY YIELD Ton/Ac	FORAGE MOISTURE %	HEADING DATE Julian	HEADING DATE Calendar	PLANT HT inches	Sawfly % Cut	PROTEIN %	ACID DET FIBER %	NEUTRAL DET FIBER %	CRUDE FIBER %	NITRATES NO3 ppm
Triticale	Trical 102	7155.8*	3.58	69.0	171.3	20-Jun	54.33	13.3	10.5	37.1	60.2	35.7	1010
Triticale	2006SFOB-48	7116.8*	3.56	72.0	170.0	19-Jun	54.13	10.0	8.6	37.5	59.0	34.2	596
Triticale	106 WCF 57	7050.1*	3.53	72.0	172.7	22-Jun	60.39	4.0	7.1	39.2	62.6	38.5	799
Triticale	108 WCF 28	6913.8*	3.46	76.8	165.3	14-Jun	51.75	8.7	9.4	33.5	58.1	32.8	2194
Triticale	111 WCF 57	6824.3*	3.41	73.4	167.3	16-Jun	51.18	13.3	10.0	38.7	61.0	36.1	760
Triticale	WCFKP 61	6705.8*	3.35	74.0	170.3	19-Jun	53.11	8.3	8.0	40.2	63.0	36.6	757
Triticale	120 WCF 57	5765.0	2.88	77.0	168.0	17-Jun	53.74	3.7	7.4	37.5	57.7	34.5	791
Triticale	110 WCF 57	5413.0	2.71	76.5	170.7	20-Jun	43.71	5.0	10.0	34.9	59.3	34.1	-
Winter Wheat	Willow Creek	7674.5**	3.84	64.3	178.0	27-Jun	51.04	28.3	8.2	36.3	59.3	34.4	1701
Winter Wheat	08TRS398	6690.7*	3.35	66.9	173.0	22-Jun	40.94	18.3	8.5	35.4	57.6	32.7	954
Winter Wheat	Elduraldo	6281.5*	3.14	71.9	170.0	19-Jun	36.88	10.3	9.3	34.1	55.6	31.5	1056
Winter Wheat	Yellowstone	6130.1	3.07	69.1	172.0	21-Jun	38.27	11.7	8.7	34.4	56.0	33.0	1045
Winter Wheat	Newturk	6057.2	3.03	73.5	169.3	18-Jun	41.65	6.7	9.7	35.5	59.6	33.8	1687
Winter Wheat	08TRS389	5839.5	2.92	72.2	167.7	17-Jun	38.98	13.3	8.5	35.2	58.0	32.6	1114
Winter Wheat	NX05M4180-6	5403.4	2.70	71.2	170.0	19-Jun	34.40	13.3	7.9	32.5	53.8	32.0	-
Winter Wheat	08TRS391	5109.4	2.55	70.9	170.3	19-Jun	45.68	18.3	8.7	36.0	59.4	34.7	-
EXPERIMENTAL MEANS		6383.2	3.2	71.9	170.4	19-Jun	46.9	11.67	8.77	36.12	58.76	34.19	1197
LSD (0.05)		1503.4	0.75	1.9	2.25	-	3.7	7.42	ns	2.04	3.42	2.3	ns
C.V.: (S / MEAN)*100		14.12	14.12	1.6	0.79	-	4.8	38.16	17.12	2.64	2.72	3.14	49.4

** Indicates highest yielding cultivar within a column.

* Indicates cultivars yielding equal to the highest yielding entry based on Fisher's Protected LSD at the 0.05 probability level.

ns denotes no significant difference between cultivars within a column at the 0.05 probability level.

Sawfly rating is reported as percentage of cut stems.

TABLE 4. WINTER CEREAL FORAGE - seed components. Winter Cereal Forage Evaluation Grown Under No-Till Dryland Fallow Conditions. Northern Agricultural Research Center. Havre, Montana. 2010. (Exp# 10-FR02-FR)

Species	CULTIVAR or SELECTION	STAND %	HEADING DATE Julian	HEADING DATE Calendar	PLNT HT Inches	1/ YIELD Bu/Ac	MOISTURE %	TEST WT Lbs/Bu	2/ PROTEIN %	3/ SAWFLY %
Triticale	110 WCF 57	100.0	170.7	18-Jun	116.5	61.8	10.3	52.8	10.6	5.0
Triticale	WCFKP 61	97.4	170.3	18-Jun	136.0	59.3	10.4	55.0	13.7	8.3
Triticale	2006SFOB-48	95.8	170.0	18-Jun	130.9	54.3	11.0	56.7	11.8	10.0
Triticale	108 WCF 28	96.9	165.3	13-Jun	125.5	51.2	10.6	55.7	14.6	8.7
Triticale	120 WCF 57	98.4	168.0	16-Jun	136.9	49.9	10.8	52.9	12.4	3.7
Triticale	106 WCF 57	95.8	172.7	20-Jun	138.3	49.2	12.3	55.3	11.9	4.0
Triticale	111 WCF 57	99.5	167.3	15-Jun	127.7	47.2	11.0	53.2	11.6	13.3
Triticale	Trical 102	94.3	171.3	19-Jun	124.1	43.9	10.0	50.7	12.8	13.3
Winter Wheat	Yellowstone	95.8	172.0	20-Jun	91.2	71.2**	10.7	62.9	10.7	11.7
Winter Wheat	08TRS398	98.4	173.0	21-Jun	102.6	64.5*	10.4	63.0	10.4	18.3
Winter Wheat	Elduraldo	99.0	170.0	18-Jun	95.2	58.3	10.4	63.4	13.9	10.3
Winter Wheat	08TRS389	99.5	167.7	15-Jun	101.4	57.8	10.4	62.6	14.4	13.3
Winter Wheat	Newturk	97.9	169.3	17-Jun	118.2	53.2	9.3	60.6	14.1	13.3
Winter Wheat	NX05M4180-6	100.0	170.0	18-Jun	89.5	50.4	10.5	63.3	11.3	6.7
Winter Wheat	08TRS391	99.5	170.3	18-Jun	108.7	50.0	10.2	61.4	14.9	18.3
Winter Wheat	Willow Creek	96.4	178.0	26-Jun	118.1	45.0	10.2	61.7	13.4	28.3
EXPERIMENTAL MEANS		97.8	170.4	18-Jun	116.3	54.2	10.5	58.2	12.7	11.7
LSD (0.05)		ns	2.2	-	11.1	9.3	0.4	0.6	-	7.4
C.V.: (S / MEAN)*100		3.4	0.8	-	5.7	10.3	2.4	0.6	-	38.2

** Indicates highest yielding cultivar within a column.

* Indicates cultivars yielding equal to the highest yielding entry based on Fisher's Protected LSD at the 0.05 probability level.

1/ Volumetric yields are based on plot weights adjusted to uniform 12 percent grain moisture and 60 lbs/bu as the standard test weight for durum.

2/ Protein values are adjusted to 12 percent grain moisture.

3/ Sawfly rating is reported as the percentage of cut stems.

Table 5. Winter Cereal Forage Site Resource & Management Data: (Exp# 10-FR02)							
Field	A-7-4		SaltHaz(MMHOS/cm) 6-24	0.40		Dry Surf Soil (in.) @ Plnt'g	4
Quarter	NW		S (ppm) 0-24	20		2" Soil Temp (°F) @ Plnt'g	84
Section	33		Zn (ppm) 0-6	0.52		4" Soil Temp (°F) @ Plnt'g	75
Tow nship	32N		Fe (ppm) 0-6	9.30		Fertilizer Formulation	Gran.Blend
Range	15E		Mn (ppm) 0-6	5.19		Fertilizer Placement	Bnd at Plntg
Latitude	N48 29.489'		Cu (ppm) 0-6	1.61		Fert. Rate (lbs/ac) N	50
Longitude	W109 47.986'		CEC 0-6	29.2		Fert. Rate (lbs/ac) P2O5	28
Soil Series	Hillon CL		Soil Texture 0-6	n/a		Fert. Rate (lbs/ac) K2O	18
pH 0-6	8.00		Soil Texture 6-24	n/a		Herbicide App. Date	n/a
Org.Matter (%) 0-6	1.60		Soil Texture 24-36	n/a		Herbicide Product	n/a
N (lbs/ac) 0-6	41		Soil Texture 36-48	n/a		Herbicide Rate (/ac)	n/a
N (lbs/ac) 6-24	51		Init PAW (in.) 0-6"	1.03		Precip (in.) Plnt'g-Harvest	13.22
N (lbs/ac) 24-36	50		Init PAW (in.) 6-24"	3.51		Precip (>.1) Plnt'g-Harvest	10.93
N (lbs/ac) 36-48	62		Init PAW (in.) 24-36"	2.40		Harvest Date	8/7
N (lbs/ac) 0-48	204		Init PAW (in.) 36-48"	2.48		Rooting Depth (in.)	30"
P (ppm) Olsen 0-6	15		Init PAW (in.) 0-48"	9.43		Post PAW (in.) 0-6"	0.68
K (ppm) 0-6	295		Cropping System	NT-ChmFlw		Post PAW (in.) 6-24"	1.67
Ca (ppm)	4953		Previous Crop	Oilseeds		Post PAW (in.) 24-36"	1.45
Mg (ppm) 0-6	428		Planting Date	9/24		Post PAW (in.) 36-48"	1.81
Na (ppm) 0-6	22		Planting Depth (in.)	1		Post PAW (in.) 0-48"	5.61
SaltHaz (MMHOS/cm) 0-6	0.57		Moist Soil Depth @ Plnt'g	48+		Precip (>.1) Hvst-Post	0.71